CLAIMS

What is Claimed is:

1. An air transducer apparatus comprising:

a piezoelectric film having a first surface and a second surface opposite said first surface;

at least one first electrode disposed on a first portion of said first surface of said film, said at least one first electrode defining an electrode area for generating a signal in response to acoustic energy incident on said piezoelectric film; and

at least one reinforcing area disposed on a second portion of said first surface of said film different from said first portion.

2. The air transducer of claim 1, further comprising:

at least one third electrode disposed on a first portion of said second surface of said film.

3. The apparatus according to claim 1, further comprising a frame member surrounded by said piezoelectric film.

4. The apparatus according to claim 3, wherein said frame member is substantially cylindrical and wherein said piezoelectric film surrounding said frame member is cylindrically shaped and having a radius larger than the radius of said frame so as to define a gap between said film and said frame member.

5. The apparatus according to claim 2, wherein said at least one third electrode is disposed on the second surface of said film so as to cover substantially the entire portion of said second surface, and wherein said second surface is the outer surface of said film.

6. The apparatus according to claim 1, further comprising a housing covering at least a portion of said piezoelectric film and formed of a material resistant to the propagation of said acoustic energy, said housing having an aperture of given dimensions for exposing a portion of said at least one first electrode for controlling the beam angle associated with the received acoustic energy.

7. The apparatus according to claim 1, wherein the at least one reinforcing area is formed from a metal material.

8. The apparatus of claim 7, wherein the metal material comprises silver ink, and a thickness of the silver ink ranges from 20-60 μm.

9. The apparatus according to claim 1, wherein the at least one reinforcing area is formed from a polymer material.

10. The apparatus of claim 9, wherein a thickness of the polymer material ranges from 25-100 μm.

11. The apparatus of claim 1, wherein the at least one reinforcing area comprises at least two reinforcing areas disposed on opposing sides of the at least one first electrode.

12. An acoustic transmitter comprising:

a cylindrical piezoelectric film having a first surface and a second surface opposite said first surface;

at least one first electrode disposed on a first portion of said first surface of said film, said at least one first electrode defining an electrode area for generating an acoustic signal in response to energy incident on said piezoelectric film;

at least one reinforcing area disposed on a second portion of said first surface of said film different from said first portion; and

means for exciting said film to generate acoustic waves at a resonance frequency.

13. The acoustic transmitter of claim 12, further comprising:

at least one third electrode disposed on a first portion of said second surface of said cylindrical piezoelectric film.

14. The acoustic transmitter of claim 12, wherein the at least one reinforcing area is formed a metal material.

15. The acoustic transmitter of claim 12, wherein the at least one reinforcing area is formed

from a polymer material.

16. The acoustic transmitter of claim 12, wherein the at least one reinforcing area comprises at least two reinforcing areas disposed on opposing sides of the at least one first electrode

17. An acoustic receiver comprising:

a cylindrical piezoelectric film having a first surface and a second surface opposite said first surface, said film responsive to acoustic energy incident thereon for vibrating at a given frequency;

at least one first electrode disposed on a first portion of said first surface of said film, said at least one first electrode defining an electrode area for generating a signal in response to acoustic energy incident on said piezoelectric film; and,

at least one reinforcing area disposed on a second portion of said first surface of said film different from said first portion.

18. The acoustic receiver of claim 17, further comprising:

at least one third electrode disposed on a first portion of said second surface of said cylindrical piezoelectric film.

19. The acoustic receiver of claim 17, wherein the at least one reinforcing area is formed from a metal material.

20. The acoustic receiver of claim 17, wherein the at least one reinforcing area is formed from a polymer material.

21. The acoustic receiver of claim 17, wherein the at least one reinforcing area comprises at least two reinforcing areas disposed on opposing sides of the at least one first electrode.

22. A transducer comprising:

a frame member having a substantially cylindrical body portion;

a substantially cylindrical piezoelectric film surrounding at least part of said frame member body portion, said piezoelectric film having at least one first electrode disposed on a first portion of a first surface of said film, and at least one reinforcing area disposed on a

second portion of the first surface of said film; and,

means for exciting said film to cause said film to vibrate at resonance frequency.

23. The transducer of claim 22, wherein said piezoelectric film material comprises Polyvinylidene Fluoride.

24. The transducer of claim 22, wherein the at least one reinforcing area is formed from a metal material.

25. The transducer of claim 22, wherein the at least one reinforcing area is formed from a polymer material.

26. The transducer of claim 22, wherein the at least one reinforcing area comprises at least two reinforcing areas disposed on opposing sides of the at least one first electrode.

27. An air transducer apparatus comprising:

a piezoelectric film having a first surface and a second surface opposite said first surface;

at least one first electrode disposed on a first portion of said first surface of said film, said at least one first electrode defining an electrode area for generating a signal in response to acoustic energy incident on said piezoelectric film;

at least one second electrode disposed on a second surface of said film opposite said first surface; and,

at least one reinforcing area disposed on the at least one second electrode.

28. The air transducer of claim 1, wherein the at least one first electrode is formed by sputtering.

29. The air transducer of claim 2, wherein the at least one second electrode is formed by sputtering.

30. A method for forming a transducer structure comprising the steps of:

depositing a first electrode layer on a first surface of a piezoelectric film;

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depositing a second electrode layer on a second surface of the piezoelectric film, , said second electrode defining an electrode area for generating a signal in response to acoustic energy incident on said piezoelectric film; and,

depositing at least one reinforcing layer on the first surface of the piezoelectric film.

31. The method of claim 30, wherein the first and second electrode layers are formed by sputtering.

32. A method for forming a transducer structure comprising the steps of:

depositing a first electrode layer on a first surface of a piezoelectric film;

depositing a second electrode layer on a second surface of the piezoelectric film, , said second electrode defining an electrode area for generating a signal in response to acoustic energy incident on said piezoelectric film; and,

depositing at least one reinforcing layer on the second surface of the piezoelectric film.

33. The method of claim 32, wherein the first and second electrode layers are formed by sputtering.